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## ABSTRACT

This Ohio Competency Analysis Profile (OCAP), derived from a modified Developing a Curriculum (DACUM) process, is a current comprehensive and verified employer competency program list for diesel mechanics. Each unit (with or without subunits) contains competencies and competency builders that identify the occupational, academic, and employability skills needed to enter this occupational area within that outline are three levels of items: core, advancing, and futuring. Core items are essential to entry-level employment. Advancing items are needed to advance in a given occupation. Futuring items are needed to enter and remain in a given occupation 3 to 4 years from now. This profile contains 17 units: (1) general safety and shop practices; (2) basic mechanical skills; (3) planned maintenance; (4) internal combustion engine operation; (5) gasoline engines; (6) diesel engines; (7) drivetrain; (8) brake systems; (9) suspension and steering; (10) chassis; (11) electrical systems; (12) truck and trailer lighting systems; (13) electronically operated control systems; (14) heating and air conditioning systems; (15) cab and trailer maintenance and repair; (16) record keeping; and (17) employability skills. (NLA)

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OCAP

## OHIO'S COMPETENCY ANALYSIS PROFILE

## DIESEL MECHANICS

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CE 059 528

# What is OCAP?

"A comprehensive and verified employer competency list will be developed and kept current for each program." This is the second objective of Imperative 3 of the *Action Plan for Accelerating the Modernization of Vocational Education: Ohio's Future at Work*. Ohio's Competency Analysis Profile (OCAP) lists are the Division of Vocational and Career Education's response to that objective. OCAP lists evolve from a modified DACUM process involving business, industry, labor, and community agency representatives from throughout Ohio. The OCAP process is directed by the Vocational Instructional Materials Laboratory at The Ohio State University's Center on Education and Training for Employment.

## How is OCAP used?

Each OCAP contains units (with and without subunits), competencies, and competency builders that identify the occupational, academic, and employability skills needed to enter a given occupation or occupational area. Within that outline there are three levels of items: core, advancing, and futuring. Core items are essential to entry-level employment. These items are required to be taught and will be the basis for questions on the state vocational competency tests (scheduled to begin in FY93). Advancing items (marked with one asterisk) are needed to advance in a given occupation. Futuring items (marked with two asterisks) are needed to enter and remain in a given occupation three to four years from now.

Districts may add as many units, subunits, competencies, and competency builders as desired to reflect local employment needs, trends, and specialties. Local advisory committees should be actively involved in the identification and verification of additional items. Using OCAP lists, instructors will be able to formulate their courses of study and monitor competency gains via the new competency testing program.

The **Employability Skills** portion of this list was verified by the following employer panel:

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## OHIO COMPETENCY ANALYSIS PROFILE

### DIESEL MECHANICS

#### UNIT 1: Safety and Shop Practices

COMPETENCY 1.0.1: Use and care for personal safety equipment

COMPETENCY BUILDERS:

- 1.0.1.1 Use eye and ear protection according to Occupational Safety and Health Administration (OSHA) standards
- 1.0.1.2 Wear proper foot and hand protection
- 1.0.1.3 Wear clothing according to OSHA standards
- 1.0.1.4 Remove jewelry
- 1.0.1.5 Secure long hair
- 1.0.1.6 Demonstrate proper lifting techniques

COMPETENCY 1.0.2: React to emergency and injury situations

COMPETENCY BUILDERS:

- 1.0.2.1 Report injury to designated supervisor
- 1.0.2.2 Explain and interpret shop safety plan
- 1.0.2.3 Demonstrate all steps of shop safety plan
- 1.0.2.4 Identify nature of injury

COMPETENCY 1.0.3: React to fire

COMPETENCY BUILDERS:

- 1.0.3.1 Demonstrate proper reporting procedures
- 1.0.3.2 Identify types of fires
- 1.0.3.3 Locate fire exits and alarms
- 1.0.3.4 Locate fire blankets and first-aid kits
- 1.0.3.5 Locate and demonstrate use of fire extinguishers
- 1.0.3.6 Inspect and maintain fire extinguishers
- 1.0.3.7 Report and/or exchange used fire extinguishers

COMPETENCY 1.0.4: Demonstrate general safety practices

COMPETENCY BUILDERS:

- 1.0.4.1 Demonstrate proper techniques of jacking, lifting, and blocking vehicles
- 1.0.4.2 Demonstrate proper equipment-moving techniques
- 1.0.4.3 Check brakes before moving equipment

(continued)

\* Advancing  
\*\* Futuring

(continued)

- 1.0.4.4 Identify dischargeable offences (e.g., horseplay, substance abuse, theft)
- 1.0.4.5 Demonstrate and explain proper use of chains and straps
- 1.0.4.6 Identify and use proper fasteners

**COMPETENCY 1.0.5: Maintain tools and equipment**

**COMPETENCY BUILDERS:**

- 1.0.5.1 Check grounding and wire condition of all electrical tools
- 1.0.5.2 Demonstrate proper care, use, and maintenance procedures for all tools and equipment
- 1.0.5.3 Check mounting shields according to OSHA standards
- 1.0.5.4 Initiate inspection by Ohio Department of Industrial Relations, Division of Safety and Hygiene
- 1.0.5.5 Demonstrate and explain safety-tag and lockout procedures for equipment

**COMPETENCY 1.0.6: Avoid hazardous situations**

**COMPETENCY BUILDERS:**

- 1.0.6.1 Maintain clean and safe work environment
- 1.0.6.2 Follow directions on hazardous materials tags or labels
- 1.0.6.3 Handle and dispose of hazardous materials
- 1.0.6.4 Interpret personal safety rights according to OSHA's Right to Know plan
- 1.0.6.5 Read and interpret material safety data sheet (MSDS)
- 1.0.6.6 Demonstrate proper action associated with hazardous chemical spill
- 1.0.6.7 Explain liability associated with hazardous material disposal

**COMPETENCY 1.0.7: Use reference and training materials provided by manufacturers**

**COMPETENCY BUILDERS:**

- 1.0.7.1 Identify and locate specific reference materials
- 1.0.7.2 Interpret reference materials
- 1.0.7.3 Attend inservice training
- 1.0.7.4 Read training materials
- 1.0.7.5 Identify resources (e.g., manufacturers' representatives)
- 1.0.7.6 Follow manufacturers' specifications

COMPETENCY 1.0.8: Use measuring tools

COMPETENCY BUILDERS:

- 1.0.8.1 Review basic math
- 1.0.8.2 Identify measuring tools and their uses
- 1.0.8.3 Measure with specific measuring tools

UNIT 2: Basic Mechanical Skills

COMPETENCY 2.0.1: Perform basic mechanical tasks

COMPETENCY BUILDERS:

- 2.0.1.1 Maintain hand tools
- 2.0.1.2 Demonstrate basic drilling and tapping techniques
- 2.0.1.3 Sharpen drill bits and chisels
- 2.0.1.4 Demonstrate correct procedure for screw extraction
- 2.0.1.5 Demonstrate correct procedure for thread repair
- 2.0.1.6 Demonstrate proper flaring techniques (single and double)
- 2.0.1.7 Demonstrate proper soldering techniques
- 2.0.1.8 Demonstrate proper wire connection techniques, including soldering and crimping

COMPETENCY 2.0.2: Perform basic welding and cutting

COMPETENCY BUILDERS:

- 2.0.2.1 Wear proper safety gloves, eye protection, and leathers
- 2.0.2.2 Demonstrate proper use of oxygen/acetylene torch in welding, brazing and cutting
- 2.0.2.3 Demonstrate proper techniques of electrical arc welding
- 2.0.2.4 Discuss new and emerging welding techniques (e.g., plasma cutting, mig & tig)

UNIT 3: Planned Maintenance

COMPETENCY 3.0.1: Inspect vehicle

COMPETENCY BUILDERS:

- 3.0.1.1 Inspect inside of cab
- 3.0.1.2 Raise cab or hood assembly and inspect
- 3.0.1.3 Inspect chassis
- 3.0.1.4 Complete inspection form

\* Advancing  
\*\* Futuring

## Diesel Mechanics--10/91

### COMPETENCY 3.0.2: Maintain fluid and filters

#### COMPETENCY BUILDERS:

- 3.0.2.1 Refer to manufacturer's specifications
- 3.0.2.2 Identify fluid and lubricant characteristics
- 3.0.2.3 Change crankcase oil
- 3.0.2.4 Change oil filter
- 3.0.2.5 Replace other filters and fluids
- 3.0.2.6 Identify proper disposal procedures for fluids and solids

### COMPETENCY 3.0.3: Lubricate vehicle components

#### COMPETENCY BUILDERS:

- 3.0.3.1 Refer to manufacturer's specifications
- 3.0.3.2 Check lubrication level for all gear boxes
- 3.0.3.3 Lubricate chassis (e.g., clutch, U-joint)
- 3.0.3.4 Lubricate hardware

### COMPETENCY 3.0.4: Maintain wheels and tires

#### COMPETENCY BUILDERS:

- 3.0.4.1 Refer to manufacturer's specifications
- 3.0.4.2 Inspect wheels, tires, and mounting
- 3.0.4.3 Check air pressure
- 3.0.4.4 Inspect, repack, and adjust wheel bearings
- 3.0.4.5 Remove tire/wheel assembly
- 3.0.4.6 Inspect, remove, and replace wheel seals

## UNIT 4: Internal Combustion Engine Operation

### COMPETENCY 4.0.1: Examine two-cycle engine

#### COMPETENCY BUILDERS:

- 4.0.1.1 Explain operation of two-cycle engine
- 4.0.1.2 Identify components and their operations

### COMPETENCY 4.0.2: Examine four-cycle engine

#### COMPETENCY BUILDERS:

- 4.0.2.1 Explain operation of four-cycle engine
- 4.0.2.2 Identify components and their operations

\* Advancing

\*\* Futuring

**UNIT 5: Gasoline Engines**

**COMPETENCY 5.0.1: Troubleshoot and repair cylinder head and valve train**

**COMPETENCY BUILDERS:**

- 5.0.1.1 Remove and clean cylinder heads
- 5.0.1.2 Inspect cylinder heads for cracks
- 5.0.1.3 Inspect gasket surface areas for warpage and leakage
- 5.0.1.4 Check fluid passage condition
- 5.0.1.5 Inspect threaded holes, stubs, and bolts
- 5.0.1.6 Install cylinder heads and gaskets
- 5.0.1.7 Inspect and test valve springs for squareness, pressure, and free height comparison\*
- 5.0.1.8 Inspect valve spring retainers, locks, and valve-lock grooves\*
- 5.0.1.9 Replace valve stem seals\*
- 5.0.1.10 Inspect valve guides for wear\*
- 5.0.1.11 Check valve guide height and stem-to-guide clearance\*
- 5.0.1.12 Recondition or replace valve guides\*
- 5.0.1.13 Inspect and resurface or replace valves\*
- 5.0.1.14 Inspect and resurface or replace valve seats\*
- 5.0.1.15 Check valve face-to-seat contact and valve seat concentricity (run-out)\*
- 5.0.1.16 Service seats and valves\*
- 5.0.1.17 Check valve spring assembled height and valve stem height\*
- 5.0.1.18 Service valve and spring assemblies\*
- 5.0.1.19 Inspect pushrods, rocker arms, rocker-arm pivots, and shafts
- 5.0.1.20 Inspect, test, and replace hydraulic or mechanical lifters
- 5.0.1.21 Adjust valves
- 5.0.1.22 Inspect and replace camshaft drives\*
- 5.0.1.23 Inspect and measure camshaft journals and lobes\*
- 5.0.1.24 Inspect and measure camshaft bearing surfaces\*
- 5.0.1.25 Time camshaft

**COMPETENCY 5.0.2: Troubleshoot and repair engine block**

**COMPETENCY BUILDERS:**

- 5.0.2.1 Inspect and replace pans, covers, gaskets, and seals
- 5.0.2.2 Inspect engine block\*
- 5.0.2.3 Clean and repair engine block\*
- 5.0.2.4 Remove cylinder wall ridges
- 5.0.2.5 Inspect and measure cylinder walls for damage and wear
- 5.0.2.6 Hone and clean cylinder walls

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\* Advancing  
\*\* Futuring

## Diesel Mechanics--10/91

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- 5.0.2.7 Inspect and measure camshaft bearings and determine needed repairs\*
- 5.0.2.8 Inspect crankshaft, check oil passage condition, and measure journal wear
- 5.0.2.9 Inspect and clean crankshaft and determine needed repairs\*
- 5.0.2.10 Inspect and measure main and connecting rod bearings
- 5.0.2.11 Identify piston and bearing wear patterns that indicate problems in connecting-rod alignment and main bearing bore
- 5.0.2.12 Inspect rod alignment and bearing bore condition\*
- 5.0.2.13 Inspect, measure, and repair or replace pistons
- 5.0.2.14 Install new piston pins and bushings
- 5.0.2.15 Inspect and repair or replace crankshaft vibration damper (harmonic balancer)
- 5.0.2.16 Visually inspect crankshaft flange and flywheel or flexplate
- 5.0.2.17 Inspect flywheel or flexplate, measure run-out, and determine needed repairs\*
- 5.0.2.18 Reassemble engine parts using correct gaskets and sealants
- 5.0.2.19 Prime engine lubrication system

COMPETENCY 5.0.3: Troubleshoot and repair lubrication and cooling systems

### COMPETENCY BUILDERS:

- 5.0.3.1 Perform oil-pressure tests
- 5.0.3.2 Inspect, measure, and repair or replace oil pumps, pressure-relief devices, and pump drives\*
- 5.0.3.3 Perform cooling system tests
- 5.0.3.4 Inspect and replace and/or adjust drive belt and pulleys
- 5.0.3.5 Inspect and replace hoses of engine-cooling and heater systems
- 5.0.3.6 Inspect, test, and replace thermostat, bypass, and housing
- 5.0.3.7 Inspect coolant
- 5.0.3.8 Drain, flush, refill, and bleed cooling system
- 5.0.3.9 Inspect, test, and replace water pump
- 5.0.3.10 Inspect, test, and replace radiator, pressure cap, and coolant-recovery system
- 5.0.3.11 Clean, inspect, test, and replace fan(s), fan clutch, fan shroud, and cooling-system-related temperature sensors or switches
- 5.0.3.12 Inspect and test oil coolers and determine needed repairs

(continued)

\* Advancing  
\*\* Futuring

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- 5.0.3.13 Inspect, test, and replace oil-temperature or oil-pressure switches and sensors
- 5.0.3.14 Perform oil change

**COMPETENCY 5.0.4: Troubleshoot and repair ignition system**

**COMPETENCY BUILDERS:**

- 5.0.4.1 Diagnose no-starting, hard starting, and engine misfiring
- 5.0.4.2 Inspect, test, and repair or replace primary circuit wiring and components of ignition system
- 5.0.4.3 Remove, inspect, test, repair, and reinstall distributor
- 5.0.4.4 Inspect, test, and repair or replace ignition system, secondary circuit wiring, and components
- 5.0.4.5 Inspect, test, and replace ignition coil
- 5.0.4.6 Check and adjust ignition system timing and verify timing advance
- 5.0.4.7 Inspect, test, and replace wiring harness and connectors of electronic ignition system
- 5.0.4.8 Inspect, test, and replace pickup sensor or trigger devices of electronic ignition system
- 5.0.4.9 Inspect, test, and replace control unit of electronic ignition system\*
- 5.0.4.10 Test spark-control system and determine needed repairs\*
- 5.0.4.11 Inspect, test, and repair or replace electrical or electronic components and circuits of spark-control system\*

**COMPETENCY 5.0.5: Troubleshoot and repair fuel and exhaust systems**

**COMPETENCY BUILDERS:**

- 5.0.5.1 Diagnose no-starting, hard starting, poor idle, flooding, hesitation, surging, engine misfiring, power loss, poor mileage, and dieseling problems on vehicle with carburetor-type fuel system and determine needed repairs\*
- 5.0.5.2 Diagnose no-starting, hard starting, poor idle, flooding, hesitation, surging, engine misfiring, power loss, poor mileage, and dieseling problems on vehicle with injection-type fuel system and determine needed repairs\*
- 5.0.5.3 Inspect and replace fuel tank, fuel-gauge sending unit, fuel tank filter, fuel cap, fuel lines, and fuel hoses

(continued)

\* Advancing  
\*\* Futuring

## Diesel Mechanics--10/91

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- 5.0.5.4 Check fuel for contaminants
- 5.0.5.5 Inspect, test, and replace fuel pumps and pump controls
- 5.0.5.6 Inspect and repair or replace fuel filters
- 5.0.5.7 Inspect, clean, adjust, test, and repair or replace cold-enrichment systems
- 5.0.5.8 Remove and replace carburetor or fuel-injection throttle body and adjust related linkages
- 5.0.5.9 Rebuild carburetor\*
- 5.0.5.10 Inspect, clean, and repair or replace carburetor mounting plates, fuel-injection air-induction system, intake manifold, and gaskets
- 5.0.5.11 Adjust carburetor idle speed and fuel mixture
- 5.0.5.12 Inspect, test, clean, and adjust or replace components of fuel-injection system\*
- 5.0.5.13 Inspect, clean, and/or replace air cleaner and element
- 5.0.5.14 Perform fuel injector tests
- 5.0.5.15 Inspect, test, and replace or reinstall exhaust manifold, exhaust pipes, mufflers, resonators, tail pipes, catalytic converter, and heat shields

### COMPETENCY 5.0.6: Troubleshoot and repair emission control systems

#### COMPETENCY BUILDERS:

- 5.0.6.1 Inspect and test positive crankcase ventilation (PCV) systems and determine needed repairs
- 5.0.6.2 Test exhaust gas recirculation (EGR) systems
- 5.0.6.3 Inspect and repair or replace EGR valves, valve manifolds, and exhaust passages of EGR systems\*
- 5.0.6.4 Inspect and repair or replace controls and hoses of EGR systems\*
- 5.0.6.5 Test air-injection emission systems\*
- 5.0.6.6 Inspect and repair or replace pumps, pressure-relief valves, filters, pulleys, and belts of air-injection emission systems\*
- 5.0.6.7 Inspect and replace bypass valves and vacuum hoses of air-injection emission systems\*
- 5.0.6.8 Inspect and repair or replace hoses, check valves, air manifolds, and injectors of air-injection emission systems\*
- 5.0.6.9 Test fuel/vapor control system and determine needed repairs\*
- 5.0.6.10 Inspect and replace liquid/vapor separator, liquid check valve, lines, and hoses of fuel/vapor control system\*

(continued)

\* Advancing  
\*\* Futuring

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- 5.0.6.11 Inspect and repair or replace canister, purge lines, and filter of fuel/vapor control system\*
- 5.0.6.12 Test inlet air-temperature control system and determine needed repairs\*
- 5.0.6.13 Inspect, test, and replace sensors, heat stove shroud, hot-air pipe, and damper of inlet air-temperature control system\*

#### UNIT 6: Diesel Engines

##### COMPETENCY 6.0.1: Troubleshoot engine

##### COMPETENCY BUILDERS:

- 6.0.1.1 Refer to manufacturer's specifications
- 6.0.1.2 Listen to and verify operator's complaint
- 6.0.1.3 Review past maintenance documents
- 6.0.1.4 Inspect fuel, oil, and coolant levels
- 6.0.1.5 Inspect engine assembly and compartment for fuel, oil, coolant, air, and other leaks
- 6.0.1.6 Listen to engine noises
- 6.0.1.7 Check engine exhaust color and quantity
- 6.0.1.8 Check fuel system
- 6.0.1.9 Perform air-intake system restriction and/or pressure test
- 6.0.1.10 Perform manifold pressure test, air box pressure test, and/or compression test and determine needed repairs\*
- 6.0.1.11 Perform exhaust back-pressure test and determine needed repairs\*
- 6.0.1.12 Perform crankcase pressure test and determine needed repairs\*
- 6.0.1.13 Diagnose no-cranking and determine needed repairs
- 6.0.1.14 Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown and determine needed repairs\*
- 6.0.1.15 Diagnose engine vibration and determine needed repairs\*
- 6.0.1.16 Locate misfiring cylinder and determine needed repairs\*
- 6.0.1.17 Test cooling system
- 6.0.1.18 Test lubrication system

\* Advancing  
\*\* Futuring

COMPETENCY 6.0.2: Troubleshoot and repair cylinder head and valve train

COMPETENCY BUILDERS:

- 6.0.2.1 Remove, clean, inspect, and replace cylinder head assembly
- 6.0.2.2 Inspect threaded holes, studs, and bolts
- 6.0.2.3 Repair or replace threaded holes, studs, and bolts
- 6.0.2.4 Inspect cylinder head mating surface areas for warpage, visible cracks, or damage and determine needed repairs\*
- 6.0.2.5 Check condition of cylinder head and block passages and determine needed repairs\*
- 6.0.2.6 Inspect core, gallery, and plugs and determine needed repairs\*
- 6.0.2.7 Pressure-test cylinder head for coolant leakage and determine needed repairs\*
- 6.0.2.8 Inspect and test valve springs for squareness, pressure, and free height comparison and replace as needed\*
- 6.0.2.9 Inspect and replace valve spring retainers and/or rotators and locks
- 6.0.2.10 Measure valve guides for wear, and repair or replace as needed\*
- 6.0.2.11 Check valve guide-to-stem clearance and repair or replace as needed\*
- 6.0.2.12 Measure valve guide height and repair or replace as needed\*
- 6.0.2.13 Replace or recondition valve guides\*
- 6.0.2.14 Inspect and recondition or replace valves\*
- 6.0.2.15 Inspect and recondition or replace valve seats\*
- 6.0.2.16 Measure valve head height relative to deck, valve face-to-seat contact, and valve seat concentricity\*
- 6.0.2.17 Repair seats and valves\*
- 6.0.2.18 Inspect and replace injector sleeves and seals\*
- 6.0.2.19 Measure injector tip or nozzle protrusion according to manufacturer's specifications\*
- 6.0.2.20 Inspect, clean, and replace precombustion chambers\*
- 6.0.2.21 Inspect and replace valve bridges (crossheads) and guides
- 6.0.2.22 Adjust valve bridges
- 6.0.2.23 Reassemble cylinder head and vacuum-test valve sealing\*
- 6.0.2.24 Inspect pushrods, rocker arms, rocker-arm shafts, and brackets
- 6.0.2.25 Inspect and adjust or replace cam followers\*
- 6.0.2.26 Adjust valve clearance

\* Advancing  
\*\* Futuring

COMPETENCY 6.0.3: Troubleshoot and repair engine block

COMPETENCY BUILDERS:

- 6.0.3.1 Inspect, repair, and install pans, covers, vents, gaskets, seals, and wear rings
- 6.0.3.2 Clean and inspect engine block for cracks and mating surface areas for warpage\*
- 6.0.3.3 Check condition of passages, core, and gallery plugs\*
- 6.0.3.4 Inspect threaded holes, studs, dowel pins, and bolts for serviceability\*
- 6.0.3.5 Pressure-test engine block for leakage and determine needed repairs\*
- 6.0.3.6 Inspect cylinder sleeve counterbore and lower bore, check bore distortion, and determine needed repairs\*
- 6.0.3.7 Clean, inspect, and measure cylinder walls or liners and determine needed repairs\*
- 6.0.3.8 Replace cylinder liners and seals\*
- 6.0.3.9 Check and adjust liner height\*
- 6.0.3.10 Inspect camshaft bearings and determine needed repairs\*
- 6.0.3.11 Inspect, measure, and replace or reinstall camshaft\*
- 6.0.3.12 Measure and/or adjust end-play of camshaft\*
- 6.0.3.13 Clean and inspect crankshaft
- 6.0.3.14 Check condition of oil passage(s) in crankshaft
- 6.0.3.15 Check passage plugs in crankshaft
- 6.0.3.16 Measure journal diameter of crankshaft
- 6.0.3.17 Check main bearing bore cap fit and determine needed repairs\*
- 6.0.3.18 Inspect and replace main bearings
- 6.0.3.19 Check bearing clearances
- 6.0.3.20 Check and adjust crankshaft end-play
- 6.0.3.21 Inspect, replace, and time drive gear train
- 6.0.3.22 Clean, inspect, measure, and replace pistons, pins, and retainers
- 6.0.3.23 Measure piston-to-cylinder wall clearance
- 6.0.3.24 Check ring-to-groove clearance and end gap and install rings on pistons
- 6.0.3.25 Identify piston and bearing wear patterns, check bearing bore and bushing condition, and determine needed repairs\*
- 6.0.3.26 Assemble pistons and connecting rods and install in block
- 6.0.3.27 Replace rod bearings and check clearances
- 6.0.3.28 Check condition, position, and clearance of piston cooling jets (nozzles)
- 6.0.3.29 Inspect, measure, and repair or replace crankshaft vibration damper and flywheel
- 6.0.3.30 Inspect, install, and align flywheel housing\*

\* Advancing  
\*\* Futuring

**COMPETENCY 6.0.4: Troubleshoot and repair lubrication systems**

**COMPETENCY BUILDERS:**

- 6.0.4.1 Check engine oil, pressure, gauge, and sending unit
- 6.0.4.2 Check level, contamination, and consumption of engine oil and pull sample for oil analysis
- 6.0.4.3 Inspect, measure, and repair or replace oil pump, drives, inlet pipes, and screens
- 6.0.4.4 Inspect and repair or replace oil-pressure regulator valves, bypass, and pressure-relief proper valves and filters
- 6.0.4.5 Inspect, clean, test, reinstall or replace, and align oil cooler
- 6.0.4.6 Test and reinstall or replace differential valve and thermostat
- 6.0.4.7 Inspect and repair or replace lines and hoses
- 6.0.4.8 Inspect turbocharger lubrication system

**COMPETENCY 6.0.5: Troubleshoot and repair cooling system**

**COMPETENCY BUILDERS:**

- 6.0.5.1 Check engine coolant level, contamination, and consumption
- 6.0.5.2 Check coolant temperature, gauge, and sending unit
- 6.0.5.3 Inspect, reinstall or replace, and adjust drive belts
- 6.0.5.4 Inspect and replace thermostat, bypasses, housing(s), and seals
- 6.0.5.5 Identify coolant types and additives
- 6.0.5.6 Discuss use of refractometer
- 6.0.5.7 Check conditioner and coolant concentration levels
- 6.0.5.8 Flush and refill cooling system
- 6.0.5.9 Bleed air from cooling system
- 6.0.5.10 Inspect and repair or replace conditioner and/or filter, check valves, lines, and fittings
- 6.0.5.11 Inspect and repair or replace water pump, hoses, and idler pulley
- 6.0.5.12 Inspect, pressure-test, and clean radiator, pressure cap, and tanks
- 6.0.5.13 Inspect and repair or replace fan hub, fan, fan clutch, controls, thermostat, and fan shroud\*
- 6.0.5.14 Inspect and repair or replace radiator shutter assembly and controls\*

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**COMPETENCY 6.0.6: Troubleshoot and repair air-induction and exhaust systems**

**COMPETENCY BUILDERS:**

- 6.0.6.1 Inspect and repair or replace air-induction piping, air cleaner, and element
- 6.0.6.2 Inspect turbocharger or engine-driven blowers and piping system
- 6.0.6.3 Remove and replace turbocharger
- 6.0.6.4 Remove and replace engine blower\*
- 6.0.6.5 Inspect and repair or replace intake manifold, gaskets, and connections
- 6.0.6.6 Inspect, clean, test, and repair or replace aftercooler assembly\*
- 6.0.6.7 Inspect and repair or replace exhaust manifold, piping, mufflers, and mounting hardware
- 6.0.6.8 Inspect and repair or replace preheater system and controls
- 6.0.6.9 Inspect and repair or replace ether or starting-fluid system and controls
- 6.0.6.10 Inspect and repair or replace emergency air-induction shutoff system

**COMPETENCY 6.0.7: Troubleshoot and repair fuel system**

**COMPETENCY BUILDERS:**

- 6.0.7.1 Explain and comply with emission control laws
- 6.0.7.2 Check level, contamination, and consumption of fuel
- 6.0.7.3 Inspect and repair or replace fuel tanks, vents, caps, mounts, screens, supply, crossover, and return lines and fittings
- 6.0.7.4 Inspect, clean, test, and repair or replace fuel transfer (lift) pump, pump drives, screens, separators, proper filters, heaters, and associated mounting hardware
- 6.0.7.5 Check fuel system for air
- 6.0.7.6 Prime and bleed fuel system
- 6.0.7.7 Repair or replace primer pump\*
- 6.0.7.8 Inspect, adjust, and repair or replace throttle-control linkage and/or electronic controls
- 6.0.7.9 Inspect, adjust, and repair or replace electronic fuel controls\*
- 6.0.7.10 Perform on-engine inspections, tests, and adjustments of distributor-type injection pump drives\*
- 6.0.7.11 Replace and/or time distributor-type injection pump drives\*

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- 6.0.7.12 Perform on-engine inspections, tests, and adjustments of in-line-type injection pump drives and/or electronic controls\*
- 6.0.7.13 Replace and/or time in-line-type injection pump drives and/or electronic controls\*
- 6.0.7.14 Perform on-engine inspections and tests of PT-type injection pump, drives, injectors, and/or electronic controls\*
- 6.0.7.15 Adjust and/or replace PT-type injection pump, drives, injectors, and/or electronic controls\*
- 6.0.7.16 Perform on-engine inspections and tests of unit injectors and/or electronic controls\*
- 6.0.7.17 Adjust and/or replace unit injectors and/or electronic controls\*
- 6.0.7.18 Inspect, test, and adjust injection nozzles and determine needed repairs\*
- 6.0.7.19 Inspect smoke limiters and determine needed repairs\*
- 6.0.7.20 Inspect and reinstall or replace high-pressure injection lines, fittings, and seals
- 6.0.7.21 Inspect low-pressure fuel lines, fittings, and seals
- 6.0.7.22 Replace or repair and reinstall low-pressure fuel lines, fittings, and seals
- 6.0.7.23 Inspect, test, and adjust engine governors and/or electronic controls and determine needed repairs\*
- 6.0.7.24 Inspect, test, and adjust engine fuel shutdown devices and controls
- 6.0.7.25 Inspect, test, and adjust safety shutdown devices, circuits, and sensors and determine needed repairs\*

COMPETENCY 6.0.8: Troubleshoot and repair engine brake systems

COMPETENCY BUILDERS:

- 6.0.8.1 Refer to manufacturer's specifications
- 6.0.8.2 Inspect and adjust engine brakes
- 6.0.8.3 Inspect, test, adjust, and repair or replace engine brake control circuits, switches, and solenoids\*
- 6.0.8.4 Inspect and repair or replace engine brake housing, valves, seals, screens, lines, and fittings\*

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**UNIT 7: Drivetrain**

**COMPETENCY 7.0.1: Troubleshoot and repair clutch**

**COMPETENCY BUILDERS:**

- 7.0.1.1 Diagnose clutch noise, binding, slippage, pulsation, grabbing, and chatter\*
- 7.0.1.2 Diagnose clutch failure
- 7.0.1.3 Inspect, adjust, and repair or replace clutch linkage, cables, levers, brackets, bushings, pivots, and springs
- 7.0.1.4 Inspect and adjust or replace hydraulic clutch slave and master cylinders
- 7.0.1.5 Inspect brake lines and brake hoses
- 7.0.1.6 Bleed brake hydraulic system
- 7.0.1.7 Inspect and adjust or replace release (throwout) bearing
- 7.0.1.8 Inspect sleeve, bushing, springs, levers, shafts, and seals of clutch system
- 7.0.1.9 Inspect and replace single-disc clutch assembly
- 7.0.1.10 Inspect, adjust, measure, and align or replace double-disc clutch assembly
- 7.0.1.11 Inspect and adjust or replace clutch/brake assembly
- 7.0.1.12 Inspect input shaft splines
- 7.0.1.13 Inspect self-adjusting clutch mechanisms
- 7.0.1.14 Inspect and replace pilot bearing
- 7.0.1.15 Inspect flywheel mounting area on crankshaft
- 7.0.1.16 Check crankshaft end-play
- 7.0.1.17 Inspect and repair or replace flywheel and starter ring gear
- 7.0.1.18 Measure flywheel face run-out and pilot bore run-out and determine needed repairs\*
- 7.0.1.19 Inspect engine block, flywheel housing, and transmission housing mating surfaces
- 7.0.1.20 Measure flywheel housing bore run-out and face run-out and determine needed repairs\*

**COMPETENCY 7.0.2: Troubleshoot and repair transmission**

**COMPETENCY BUILDERS:**

- 7.0.2.1 Diagnose transmission noise, shifting, lockup, jumping out-of-gear, overheating, and vibration problems\*
- 7.0.2.2 Diagnose transmission component failure before and during disassembly and determine needed repairs\*
- 7.0.2.3 Inspect, adjust, and repair or replace transmission remote shift linkages, brackets, bushings, pivots, and levers

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(continued)

- 7.0.2.4 Inspect, test, adjust, and repair or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies
- 7.0.2.5 Inspect and replace transmission mounts, insulators, and mounting bolts
- 7.0.2.6 Inspect transmission cover plates, gaskets, seals, and cap bolts for leakage and replace as needed
- 7.0.2.7 Inspect seal surfaces
- 7.0.2.8 Check transmission fluid for proper level, type, and condition according to manufacturer's specifications
- 7.0.2.9 Drain and refill transmission
- 7.0.2.10 Check magnetic plugs and vents
- 7.0.2.11 Inspect and adjust or replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts\*
- 7.0.2.12 Remove and reinstall transmission and check crankshaft end-play
- 7.0.2.13 Inspect and replace input shaft, gear, spacers, bearings, retainers, and slingers\*
- 7.0.2.14 Inspect, adjust, and replace main shaft, gears, sliding clutches, washers, spacers, bushings, bearings, auxiliary drive assemblies, retainers, and keys\*
- 7.0.2.15 Inspect and replace countershafts, gears, bearings, retainers, and keys\*
- 7.0.2.16 Adjust bearing preload and time-multiple countershaft gears\*
- 7.0.2.17 Inspect and replace output shafts, gears, washers, spacers, bearings, retainers, and keys\*
- 7.0.2.18 Inspect and replace reverse idler shafts, gears, bushings, bearings, thrust washers, and retainers\*
- 7.0.2.19 Check reverse idler gear end-play\*
- 7.0.2.20 Inspect and replace synchronizer hub, sleeve, keys, springs, blocking rings, synchronizer plates, blocker pins, and sliding clutches\*
- 7.0.2.21 Inspect and repair or replace transmission cases
- 7.0.2.22 Inspect and repair or replace transmission lubrication system pumps, troughs, collectors, and slingers\*
- 7.0.2.23 Inspect and replace transmission oil filters and inspect coolers
- 7.0.2.24 Inspect mechanical speedometer components
- 7.0.2.25 Inspect electronic speedometer components
- 7.0.2.26 Inspect, adjust, and repair or replace power take-off (PTO) assemblies, controls, and shafts\*
- 7.0.2.27 Inspect and test backup light, neutral start, and warning device circuit switches
- 7.0.2.28 Inspect and test transmission temperature gauge circuit for accuracy
- 7.0.2.29 Inspect, adjust, remove, and replace transfer case assemblies

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**COMPETENCY 7.0.3: Troubleshoot and repair driveshaft and universal joint**

**COMPETENCY BUILDERS:**

- 7.0.3.1 Diagnose noise and vibration problems in driveshaft and universal joint and determine needed repairs\*
- 7.0.3.2 Inspect and repair or replace driveshaft, slip joints, yokes, drive flanges, and universal joints
- 7.0.3.3 Check phasing of all yokes
- 7.0.3.4 Inspect and repair or replace driveshaft center support bearings and mounts
- 7.0.3.5 Measure and adjust loaded and unloaded driveline angles\*

**COMPETENCY 7.0.4: Troubleshoot and repair drive axle**

**COMPETENCY BUILDERS:**

- 7.0.4.1 Diagnose noise and overheating in rear-axle drive unit problems and determine needed repairs\*
- 7.0.4.2 Check for and repair fluid leaks
- 7.0.4.3 Inspect and replace cover plates, gaskets, vents, magnetic plugs, and seals of rear-axle drive unit
- 7.0.4.4 Check fluid level and condition in rear-axle drive unit and determine needed repair
- 7.0.4.5 Add lubricant to rear-axle drive unit
- 7.0.4.6 Inspect and repair or replace differential carrier assembly
- 7.0.4.7 Inspect and repair or replace differential case assembly\*
- 7.0.4.8 Inspect and replace components of traction-control differential case assembly\*
- 7.0.4.9 Inspect differential carrier case and cap, side-bearing bores, and pilot-bearing bore and determine needed repairs\*
- 7.0.4.10 Measure ring gear run-out and determine needed repairs\*
- 7.0.4.11 Inspect and replace ring gears, drive-pinion gears, spacers, sleeves, bearing cage, and bearings\*
- 7.0.4.12 Measure and adjust drive-pinion bearing preload\*
- 7.0.4.13 Adjust drive-pinion depth\*
- 7.0.4.14 Measure and adjust side-bearing preload and ring and pinion backlash\*
- 7.0.4.15 Check and interpret ring and pinion tooth contact pattern and adjust according to manufacturers' specifications\*
- 7.0.4.16 Inspect and adjust or repair ring-gear thrust block or screw\*

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- 7.0.4.17 Inspect, adjust, and repair or replace planetary-gear-type 2-speed axle assembly\*
- 7.0.4.18 Inspect and repair or replace speedometer adapters, motors, axle-shift units, wires, air lines, and connectors of 2-speed axle-shift control systems\*
- 7.0.4.19 Inspect and adjust power divider assembly\*
- 7.0.4.20 Inspect, adjust, and repair or replace air-operated power divider lockout assembly\*
- 7.0.4.21 Inspect and measure rear-axle housing mating surfaces and alignment and determine needed repairs\*
- 7.0.4.22 Inspect and repair or replace rear-axle lubrication system pump troughs, collectors, slingers, tubes, and filters\*
- 7.0.4.23 Inspect and replace rear-axle shafts
- 7.0.4.24 Remove and replace wheel assembly
- 7.0.4.25 Check rear-wheel seal and axle flange gasket
- 7.0.4.26 Diagnose noises and damage of rear-wheel bearing
- 7.0.4.27 Clean, inspect, lubricate, and replace wheel bearings
- 7.0.4.28 Replace seals and wear rings
- 7.0.4.29 Adjust rear-wheel bearings
- 7.0.4.30 Inspect and test rear-axle temperature gauge sensor for accuracy and determine needed repairs

## UNIT 8: Brake Systems

### SUBUNIT 8.1: Air Brakes

COMPETENCY 8.1.1: Troubleshoot and repair air supply and service systems

#### COMPETENCY BUILDERS:

- 8.1.1.1 Diagnose poor stopping, air leaks, pulling, grabbing, and dragging and determine needed repairs\*
- 8.1.1.2 Check air-system buildup time
- 8.1.1.3 Drain air reservoir tanks and check for oil, water, and foreign material
- 8.1.1.4 Inspect, align, and adjust or replace compressor drive belts and pulleys
- 8.1.1.5 Inspect, repair or replace, and time compressor drive gear and coupling
- 8.1.1.6 Inspect and repair or replace air compressor, air cleaner, and oil and water lines and fittings
- 8.1.1.7 Inspect, test, adjust, and replace system-pressure controls, couplings, filters, lines, hoses, and fittings

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\* Advancing  
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- 8.1.1.8 Inspect, test, adjust, and replace unloaded assembly valves\*
- 8.1.1.9 Inspect, test, clean, and replace air-tank relief valves, one-way check valves, drain-cocks, spitter valves, heaters, wiring, and connectors
- 8.1.1.10 Inspect, clean, and repair or replace air-drier systems, filters, valves, heaters, wiring, and connectors
- 8.1.1.11 Inspect, test, adjust, and repair or replace brake application valve, fittings, and mounts
- 8.1.1.12 Inspect, test, clean, and replace two-way check valves
- 8.1.1.13 Inspect, test, and repair or replace circuit switches, wiring, and connectors of stoplight and parking brake light
- 8.1.1.14 Inspect, test, and repair or replace hand brake (trailer) control valve, lines, fittings, and mountings
- 8.1.1.15 Inspect, test, and repair or replace brake-relay valve
- 8.1.1.16 Inspect, test, and replace quick-release valves
- 8.1.1.17 Inspect, test, and replace limiting quick-release valve
- 8.1.1.18 Inspect, test, and replace tractor-protection valve
- 8.1.1.19 Inspect, test, and replace emergency brake-control valve
- 8.1.1.20 Inspect, test, and replace inversion valve
- 8.1.1.21 Inspect, test, and repair or replace low-pressure warning devices
- 8.1.1.22 Inspect, test, and replace air-pressure gauges, lines, and fittings
- 8.1.1.23 Identify operation of automatic braking system (ABS)

**COMPETENCY 8.1.2: Troubleshoot and repair mechanical/foundation brake components**

**COMPETENCY BUILDERS:**

- 8.1.2.1 Diagnose poor stopping, brake noise, pulling, grabbing, and dragging and determine needed repairs\*
- 8.1.2.2 Inspect, test, and adjust, repair or replace brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets
- 8.1.2.3 Inspect and adjust, repair, or replace manual and automatic slack adjusters
- 8.1.2.4 Inspect and repair or replace cams, rollers, shafts, bushings, seals, spacers, and retainers
- 8.1.2.5 Inspect and repair or replace brake spider, shields, anchor pins, bushings, and springs
- 8.1.2.6 Inspect, repair or replace, and adjust wedge-type brake housing, plungers, and wedge assembly

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- 8.1.2.7 Inspect and repair or replace wedge brake spider, manual adjuster plungers, and automatic adjuster plungers
- 8.1.2.8 Inspect, clean, and adjust air-disc brake caliper assemblies
- 8.1.2.9 Inspect and replace brake shoes or pads
- 8.1.2.10 Inspect brake drums or rotors and ensure parts meet Department of Transportation (DOT) specifications

### COMPETENCY 8.1.3: Troubleshoot and repair parking brakes

#### COMPETENCY BUILDERS:

- 8.1.3.1 Inspect and adjust, repair, or replace drums, rotors, bands, shoes, mounting hardware, and adjusters of driveline parking brake
- 8.1.3.2 Inspect and adjust, repair, or replace application system pedal, cables, linkage, levers, pivots, and springs of driveline parking brake
- 8.1.3.3 Check operation of parking brake chamber (i.e., air brakes and spring brake)
- 8.1.3.4 Demonstrate proper changing of spring chamber during removal and replacement
- 8.1.3.5 Inspect, test, and replace check valves, lines, hoses, and fittings of parking brake
- 8.1.3.6 Inspect, test, and replace parking brake application and release valve
- 8.1.3.7 Release and reset parking brakes manually according to manufacturers' recommendations

### SUBUNIT 8.2: Basic Hydraulics

#### COMPETENCY 8.2.1: Examine basic hydraulic theory

#### COMPETENCY BUILDERS:

- 8.2.1.1 Explain Pascal's Law
- 8.2.1.2 Explain hydraulic pressure (i.e., neutral, working, and relief)
- 8.2.1.3 Identify major causes of hydraulic failure (e.g., dirt, air, heat)

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**COMPETENCY 8.2.2: Examine hydraulic components and their relationships**

**COMPETENCY BUILDER:**

- 8.2.2.1 Identify sump characteristics
- 8.2.2.2 Identify filtration characteristics
- 8.2.2.3 Identify fluid characteristics according to manufacturer's specifications
- 8.2.2.4 Identify characteristics of different pumps (e.g., vane, gear, piston)
- 8.2.2.5 Identify hydraulic motor characteristics
- 8.2.2.6 Identify control valve characteristics
- 8.2.2.7 Identify relief valve characteristics
- 8.2.2.8 Identify hydraulic symbols
- 8.2.2.9 Identify single and double action symbols

**SUBUNIT 8.3: Hydraulic Brakes**

**COMPETENCY 8.3.1: Troubleshoot and repair hydraulic system**

**COMPETENCY BUILDERS:**

- 8.3.1.1 Diagnose poor stopping, pulling, and dragging problems
- 8.3.1.2 Pressure-test hydraulic system and inspect for leaks
- 8.3.1.3 Check and adjust brake pedal pushrod length
- 8.3.1.4 Inspect and test master cylinder and determine needed repairs
- 8.3.1.5 Inspect, test, and replace brake lines, flexible hoses, and fittings
- 8.3.1.6 Inspect, test, and replace metering, proportioning, and combination valves\*
- 8.3.1.7 Inspect, test, and repair or replace brake-pressure differential valve and warning light circuit-switch, bulbs, wiring, and connectors
- 8.3.1.8 Inspect and rebuild or replace wheel cylinders
- 8.3.1.9 Inspect disc-brake caliper assemblies
- 8.3.1.10 Bleed and/or flush hydraulic system
- 8.3.1.11 Inspect, test, and repair or replace hydraulic parking brake system
- 8.3.1.12 Explain operation of ABS
- 8.3.1.13 Explain safety in relation to extreme high pressure of brake fluid in ABS

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**COMPETENCY 8.3.2: Troubleshoot and repair power-assist units and related components**

**COMPETENCY BUILDERS:**

- 8.3.2.1 Diagnose poor stopping caused by power-brake booster and determine needed repairs\*
- 8.3.2.2 Inspect, test, and replace booster, hoses and control valves of power brake\*
- 8.3.2.3 Test, adjust, and replace brake stoplight switch, bulbs, wiring, and connectors

**UNIT 9: Suspension and Steering**

**COMPETENCY 9.0.1: Troubleshoot and repair steering column and manual steering gear**

**COMPETENCY BUILDERS:**

- 9.0.1.1 Diagnose steering system problems, column and shaft noise, looseness, and binding problems
- 9.0.1.2 Inspect and replace steering shaft U-joint, slip joints, bearings, bushings, and seals
- 9.0.1.3 Phase steering shaft U-joints
- 9.0.1.4 Diagnose noise, binding, uneven turning effort, looseness, hard steering, and lubricant leakage in manual steering gear
- 9.0.1.5 Inspect lubricant for proper type, level, and condition
- 9.0.1.6 Inspect and repair or replace bushings, bearings, shafts, seals, gaskets, and mounting bolts of manual steering gear
- 9.0.1.7 Adjust worm-bearing preload of manual steering gear
- 9.0.1.8 Determine center position of pitman shaft
- 9.0.1.9 Adjust sector shaft lash

**COMPETENCY 9.0.2: Troubleshoot and repair power steering units**

**COMPETENCY BUILDERS:**

- 9.0.2.1 Refer to manufacturer's specifications
- 9.0.2.2 Diagnose problems in power steering system and determine needed repairs\*
- 9.0.2.3 Inspect power steering fluid type, level, and condition
- 9.0.2.4 Purge power steering system
- 9.0.2.5 Perform power steering system pressure and flow tests and determine needed repairs\*
- 9.0.2.6 Inspect and repair or replace power steering reservoir including filter, seals, and gaskets\*

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- 9.0.2.7 Inspect, replace, adjust, and align belts and pulleys of power steering pump\*
- 9.0.2.8 Inspect and replace drive gear and coupling of power steering pump\*
- 9.0.2.9 Inspect and repair or replace power steering pump, mountings, and brackets\*
- 9.0.2.10 Inspect and replace pressure-regulator valves of power steering pump\*
- 9.0.2.11 Inspect and replace cooler, lines, hoses, and fittings of power steering system
- 9.0.2.12 Inspect, repair or replace, and adjust linkage assist-type power steering control and remote relief valves (air and hydraulic)\*
- 9.0.2.13 Inspect, replace, and adjust linkage assist-type power steering cylinder\*
- 9.0.2.14 Inspect, replace, and adjust integral-type power steering gear\*
- 9.0.2.15 Inspect, replace, and adjust dual power steering gear systems\*

COMPETENCY 9.0.3: Troubleshoot and repair steering linkage

COMPETENCY BUILDERS:

- 9.0.3.1 Inspect and replace pitman arm
- 9.0.3.2 Inspect and adjust or replace drag link and tie rod
- 9.0.3.3 Inspect and adjust or replace drag-link and tie-rod ends
- 9.0.3.4 Inspect and replace idler arm, bearings, and bushings
- 9.0.3.5 Inspect and replace steering arm, levers, and linkage pivot joints
- 9.0.3.6 Inspect, replace, and position clamps and retainers
- 9.0.3.7 Check and adjust steering linkage or wheel stops

COMPETENCY 9.0.4: Troubleshoot, adjust, and repair wheel alignment

COMPETENCY BUILDERS:

- 9.0.4.1 Refer to manufacturer's specifications
- 9.0.4.2 Explain reasons for vehicle wandering, pulling, shimmy, and hard steering
- 9.0.4.3 Explain camber and king pin inclination
- 9.0.4.4 Explain caster in relation to chassis angle
- 9.0.4.5 Check and adjust toe
- 9.0.4.6 Check rear-axle alignment (e.g., thrustline, centerline) and tracking
- 9.0.4.7 Diagnose turning-angle problems (e.g., Ackerman-angle, toe-out-on-turns)

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### COMPETENCY 9.0.5: Troubleshoot and repair suspension systems

#### COMPETENCY BUILDERS:

- 9.0.5.1 Diagnose rough-ride problems\*
- 9.0.5.2 Inspect front axles, U-bolts, and nuts and determine needed repairs
- 9.0.5.3 Inspect and repair king pin, steering knuckle bushings, locks, bearings, seals, and covers
- 9.0.5.4 Inspect and repair or replace shock absorbers, bushings, brackets, and mounts
- 9.0.5.5 Inspect and repair leaf springs, center bolts, clips, eye bolts and bushings, shackles, slippers, insulators, brackets, and mounts
- 9.0.5.6 Inspect and repair torsion bars, bell cranks, ratchets, bushings, bearings, and mounting brackets
- 9.0.5.7 Inspect torque arms, bushings, and mounts
- 9.0.5.8 Inspect axle-aligning devices (e.g., radius rods, track bars, stabilizer bars, bushings, mounts, shims, cams)
- 9.0.5.9 Inspect and repair or replace walking beams, center tubes, bushings, mounts, load pads, and caps\*
- 9.0.5.10 Inspect, test, repair or replace, and adjust air-suspension pressure-regulator and height-control valves, lines, hoses, and fittings\*
- 9.0.5.11 Inspect, test, and replace air bags, springs, mounting plates, suspension arms, and bushings\*
- 9.0.5.12 Measure vehicle riding height and determine needed adjustments or repairs according to manufacturer's specifications\*

### COMPETENCY 9.0.6: Troubleshoot and repair wheels and tires

#### COMPETENCY BUILDERS:

- 9.0.6.1 Explain unusual tire wear patterns
- 9.0.6.2 Explain wheel/tire vibration, shimmy, pounding, and hop (tramp) problems
- 9.0.6.3 Inspect and replace wheels, rims, spacers, clamps, studs, and nuts
- 9.0.6.4 Inspect multipiece rim assembly according to manufacturer's specifications
- 9.0.6.5 Measure and explain wheel and tire radial and lateral run-out
- 9.0.6.6 Explain proper tire-to-wheel assembly procedure
- 9.0.6.7 Inspect tires and check air pressure
- 9.0.6.8 Perform static balance of wheel/tire assembly
- 9.0.6.9 Perform dynamic balance of wheel/tire assembly
- 9.0.6.10 Measure tire diameter and match tires on tandem axles
- 9.0.6.11 Inspect, repair or replace, and adjust front-wheel speedometer drive assembly

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UNIT 10: Chassis

COMPETENCY 10.0.1: Inspect frame

COMPETENCY BUILDERS:

- 10.0.1.1 Inspect and explain repair of fifth-wheel assembly
- 10.0.1.2 Inspect frame and frame rails for cracks and loose fasteners
- 10.0.1.3 Inspect and/or install hangers, brackets, crossmembers, and gussets

COMPETENCY 10.0.2: Examine frame construction theory

COMPETENCY BUILDERS:

- 10.0.2.1 Explain effects of heat treating of frame rails (e.g., on tensile strength)
- 10.0.2.2 Demonstrate proper fastening of attachments
- 10.0.2.3 Demonstrate proper frame repair according to Truck Frame and Axle Repair Association (TARA)\*

UNIT 11: Electrical Systems

COMPETENCY 11.0.1: Examine basic concepts of electricity

COMPETENCY BUILDERS:

- 11.0.1.1 Discuss evolution of electricity
- 11.0.1.2 Explain magnetism
- 11.0.1.3 Explain current flow
- 11.0.1.4 Explain voltage (e.g., electromotive force [EMF])
- 11.0.1.5 Explain resistance (e.g., watt flow)
- 11.0.1.6 Explain Ohm's Law
- 11.0.1.7 Explain wattage
- 11.0.1.8 Explain conventional and electron theories of electron flow
- 11.0.1.9 Identify basic electrical symbols

COMPETENCY 11.0.2: Examine basic terms and tools

COMPETENCY BUILDERS:

- 11.0.2.1 Explain schematics
- 11.0.2.2 Explain wiring diagrams
- 11.0.2.3 Read digital and analog meters accurately
- 11.0.2.4 Explain operations of sol and relays

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**COMPETENCY 11.0.3: Troubleshoot electrical/electronic systems**

**COMPETENCY BUILDERS:**

- 11.0.3.1 Check continuity in electrical or electronic circuits
- 11.0.3.2 Check applied voltages, circuit voltages, and voltage drops in electrical or electronic circuits using a digital volt ohmmeter (DVOM), digital multimeter (DMM), and analog voltmeter
- 11.0.3.3 Check current flow in electrical or electronic circuits and components using an ammeter
- 11.0.3.4 Check resistance in electrical or electronic circuits and components using an ohmmeter
- 11.0.3.5 Find shorts and grounds in electrical or electronic circuits
- 11.0.3.6 Diagnose key-off battery drain
- 11.0.3.7 Inspect, test, and replace fusible links, circuit breakers, relays, solenoids, and fuses
- 11.0.3.8 Identify characteristics of spike suppression diodes or resistors

**COMPETENCY 11.0.4: Troubleshoot and repair or replace batteries**

**COMPETENCY BUILDERS:**

- 11.0.4.1 Perform battery hydrometer test and determine specific gravity of each cell
- 11.0.4.2 Perform battery capacity test and determine needed repairs
- 11.0.4.3 Determine battery state-of-charge by measuring terminal post voltage using a DVOM or DMM
- 11.0.4.4 Inspect, clean, and repair or replace battery
- 11.0.4.5 Inspect, clean, and repair or replace battery boxes, mounts, and hold-downs
- 11.0.4.6 Charge battery using slow-charge or fast-charge method
- 11.0.4.7 Inspect, clean, and repair or replace battery cables and connectors
- 11.0.4.8 Jump-start vehicle using jumper cables and booster battery or auxiliary power supply according to approved safety procedures and manufacturer's specifications

**COMPETENCY 11.0.5: Troubleshoot and repair starting system**

**COMPETENCY BUILDERS:**

- 11.0.5.1 Perform starter current draw test
- 11.0.5.2 Perform starter circuit voltage drop tests
- 11.0.5.3 Inspect, test, and replace components and wires in starter control circuit
- 11.0.5.4 Remove and replace starter
- 11.0.5.5 Inspect, test, and replace starter relays and solenoids or switches
- 11.0.5.6 Diagnose series/parallel (12/24 volt) problems in starting system and determine needed repairs\*

**COMPETENCY 11.0.6: Troubleshoot and repair charging system**

**COMPETENCY BUILDERS:**

- 11.0.6.1 Diagnose no-charge, low-charge, or overcharge condition of dash-mounted charge meters and/or indicator lights and determine needed repairs
- 11.0.6.2 Diagnose no-charge, low-charge, or overcharge condition and determine needed repairs
- 11.0.6.3 Inspect, adjust, and replace drive belts, pulleys, fans, and mounting brackets of alternator
- 11.0.6.4 Inspect and replace drive gears and couplings of alternator
- 11.0.6.5 Perform charging system output test
- 11.0.6.6 Perform charging circuit voltage drop tests and determine needed repairs
- 11.0.6.7 Remove and replace alternator
- 11.0.6.8 Inspect and repair or replace connectors and wires in charging circuit
- 11.0.6.9 Diagnose 12/24 volt alternator problems in charging system

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UNIT 12: Truck and Trailer Lighting Systems

COMPETENCY 12.0.1: Troubleshoot and repair headlights, parking lights, clearance lights, taillights, cab lights, and dash lights

COMPETENCY BUILDERS:

- 12.0.1.1 Explain cause of brighter-than-normal, intermittent, dim, or inoperative headlights
- 12.0.1.2 Test, aim, and replace headlights
- 12.0.1.3 Test and repair or replace headlight and dimmer switches, wires, connectors, and sockets
- 12.0.1.4 Inspect, test, and repair or replace switches, bulbs, sockets, connectors, and wires of parking light, clearance light, and taillight circuits
- 12.0.1.5 Inspect, test, and repair or replace circuit switches, bulbs, sockets, connectors, wires, and printed circuits or control modules of dash lights
- 12.0.1.6 Inspect, test, and repair or replace circuit switches, bulbs, sockets, connectors, and wires of interior cab light

COMPETENCY 12.0.2: Troubleshoot and repair stoplights, turn signals, hazard lights, and backup lights

COMPETENCY BUILDERS:

- 12.0.2.1 Inspect, test, repair or replace, and adjust circuit switches, bulbs, sockets, connectors, and wires of stoplight
- 12.0.2.2 Diagnose failure of one or both turn signals or hazard lights
- 12.0.2.3 Inspect, test, and repair or replace turn signal and hazard circuit flasher, switches, bulbs, sockets, connectors, and wires
- 12.0.2.4 Inspect, test, and adjust, repair, or replace backup light and warning device circuit switches, bulbs, sockets, horns, buzzers, connectors, and wires

COMPETENCY 12.0.3: Troubleshoot and repair gauges and warning devices

COMPETENCY BUILDERS:

- 12.0.3.1 Diagnose gauge problems (i.e., intermittent, high, low, or no readings) and determine needed repairs
- 12.0.3.2 Test and replace voltage regulators of gauge circuit
- 12.0.3.3 Inspect, test, and adjust, repair, or replace gauge circuit sending units, gauges, connectors, and wires
- 12.0.3.4 Inspect, test, and repair or replace warning light circuit sending units, bulbs, sockets, connectors, wires, and printed circuits or control modules
- 12.0.3.5 Inspect, test, and repair or replace warning buzzer circuit sending units, buzzers, switches, relays, connectors, wires, and printed circuits or control modules
- 12.0.3.6 Inspect, test, replace, and calibrate electronic speedometer, odometer, and tachometer systems

COMPETENCY 12.0.4: Troubleshoot and repair related electrical components

COMPETENCY BUILDERS:

- 12.0.4.1 Diagnose horn problems (i.e., constant, intermittent, or no operation)
- 12.0.4.2 Inspect, test, and repair or replace horn circuit relays, horns, switches, connectors, and wires
- 12.0.4.3 Diagnose wiper speed control and/or park problems (i.e., constant, intermittent, or no operation)
- 12.0.4.4 Inspect, test, and repair or replace wiper motor, resistors, park switch, relays, switches, connectors, and wires
- 12.0.4.5 Inspect and replace wiper motor transmission linkage, arms, and blades
- 12.0.4.6 Inspect, test, and repair or replace windshield-washer motor or pump/relay assembly, switches, connectors, and wires
- 12.0.4.7 Inspect, test, and repair or replace mirror, heater circuit grids, motors, relays, switches, connectors, and wires
- 12.0.4.8 Inspect, test, and repair or replace electrical components of heater and air-conditioning (AC)
- 12.0.4.9 Inspect, test, and repair or replace cigarette lighter case, integral fuse, connectors, and wires
- 12.0.4.10 Diagnose side window problems (i.e., slow, intermittent, or no-power operation)

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- 12.0.4.11 Inspect, test, and repair or replace motors, switches, relays, connectors, and wires of power side window circuits
- 12.0.4.12 Inspect preheaters

UNIT 13: Electronically Operated Control Systems\*

COMPETENCY 13.0.1: Test system components\*

COMPETENCY BUILDERS:

- 13.0.1.1 Test system-sensing unit\*
- 13.0.1.2 Test system computer\*
- 13.0.1.3 Test system activators\*
- 13.0.1.4 Test all system connections and wiring\*

COMPETENCY 13.0.2: Test electronic fuel system\*

COMPETENCY BUILDERS:

- 13.0.2.1 Test system-sensing unit\*
- 13.0.2.2 Test system activator\*

COMPETENCY 13.0.3: Test electronic automatic transmission\*

COMPETENCY BUILDERS:

- 13.0.3.1 Test system computer\*
- 13.0.3.2 Test system-sensing unit\*
- 13.0.3.3 Test system activator\*

COMPETENCY 13.0.4: Test electronic emission system\*

COMPETENCY BUILDERS:

- 13.0.4.1 Test system computer\*
- 13.0.4.2 Test system-sensing unit\*
- 13.0.4.3 Test system activator\*

COMPETENCY 13.0.5: Test electronic braking system\*

COMPETENCY BUILDERS:

- 13.0.5.1 Test system computer\*
- 13.0.5.2 Test system-sensing unit\*
- 13.0.5.3 Test system activator\*

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**UNIT 14: Heating and Air-Conditioning (AC) Systems**

**COMPETENCY 14.0.1: Troubleshoot and repair AC system**

**COMPETENCY BUILDERS:**

- 14.0.1.1 Diagnose unusual operating noises in AC system
- 14.0.1.2 Identify type of AC system and conduct performance test
- 14.0.1.3 Diagnose AC system problems indicated by pressure-gauge readings
- 14.0.1.4 Diagnose AC system problems indicated by visual and touch procedures
- 14.0.1.5 Leak-test AC system
- 14.0.1.6 Identify proper and safe procedures for recovering refrigerant from AC system
- 14.0.1.7 Evacuate AC system
- 14.0.1.8 Clean AC system components and hoses according to manufacturer's specifications
- 14.0.1.9 Charge AC system with refrigerant
- 14.0.1.10 Inspect and correct oil level in AC system

**COMPETENCY 14.0.2: Troubleshoot and repair compressor and clutch of refrigeration system**

**COMPETENCY BUILDERS:**

- 14.0.2.1 Explain AC system problems that cause pressure-protection devices to interrupt system operation
- 14.0.2.2 Inspect pressure-protection devices of AC system
- 14.0.2.3 Inspect and adjust drive belts and pulleys of AC compressor
- 14.0.2.4 Inspect, test, and repair or replace clutch components or assembly of AC compressor
- 14.0.2.5 Inspect and correct oil level in AC compressor
- 14.0.2.6 Inspect, test, and repair or replace AC compressor
- 14.0.2.7 Inspect and repair or replace AC compressor mountings

**COMPETENCY 14.0.3: Troubleshoot and repair evaporator, condenser, and related components**

**COMPETENCY BUILDERS:**

- 14.0.3.1 Inspect and repair or replace mufflers, hoses, lines, filters, fittings, and seals of AC system
- 14.0.3.2 Inspect AC condenser for airflow restrictions and clean and straighten fins
- 14.0.3.3 Inspect, test, and replace condenser and mountings of AC system

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(continued)

- 14.0.3.4 Inspect and replace receiver/drier
- 14.0.3.5 Inspect and replace accumulator or drier in orifice tube AC system
- 14.0.3.6 Inspect, test, and replace expansion valve
- 14.0.3.7 Inspect, test, and replace orifice tube
- 14.0.3.8 Inspect, test, clean, and replace evaporator
- 14.0.3.9 Inspect, clean, and repair evaporator housing and water drain
- 14.0.3.10 Identify, inspect, and replace AC system service valves
- 14.0.3.11 Inspect and replace high-pressure relief device of AC system

**COMPETENCY 14.0.4: Troubleshoot and repair cab heating systems**

### COMPETENCY BUILDERS:

- 14.0.4.1 Explain cause of temperature-control problems in heating and ventilation systems
- 14.0.4.2 Diagnose window-fogging problems
- 14.0.4.3 Perform cooling system tests
- 14.0.4.4 Inspect and replace hoses and belts of heater system
- 14.0.4.5 Inspect, test, and replace radiator, pressure cap, coolant-recovery system, and water pump
- 14.0.4.6 Inspect, test, and replace thermostat, bypass, and housing
- 14.0.4.7 Inspect coolant
- 14.0.4.8 Remove, flush, and refill system with proper coolant
- 14.0.4.9 Inspect, test, and replace fan, fan clutch, and fan shroud
- 14.0.4.10 Inspect, test, and replace heater/coolant control valve
- 14.0.4.11 Inspect, flush, and replace heater core

**COMPETENCY 14.0.5: Troubleshoot and repair electrical heating and AC operating systems\***

### COMPETENCY BUILDERS:

- 14.0.5.1 Diagnose failures in electrical/electronic control systems of heating, ventilating, and AC systems and determine needed repairs\*
- 14.0.5.2 Inspect, test, and repair or replace AC/heater blower motors, resistors, switches, relay or modules, wiring, and protection devices\*
- 14.0.5.3 Inspect, test, and repair or replace AC compressor clutch, relay or modules, wiring, sensors, switches, diodes, and protection devices\*

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COMPETENCY 14.0.6: Troubleshoot and repair vacuum/mechanical heating and AC operating systems\*

COMPETENCY BUILDERS:

- 14.0.6.1 Diagnose failures in controls of heating, ventilating, and AC systems\*
- 14.0.6.2 Inspect, test, and repair or replace control panel assemblies of heating, ventilating, and AC systems\*
- 14.0.6.3 Inspect, test, and adjust or replace cables and linkages of heating, ventilating, and AC control systems\*
- 14.0.6.4 Inspect, test, and adjust or replace ducts, doors, hoses, and outlets of heating, ventilating, and AC systems\*
- 14.0.6.5 Diagnose problems in temperature-control system\*
- 14.0.6.6 Diagnose problems in blower system and determine needed repairs\*
- 14.0.6.7 Diagnose problems in air-distribution system and determine needed repairs\*
- 14.0.6.8 Diagnose problems in compressor-clutch control system and determine needed repairs\*
- 14.0.6.9 Inspect, test, and adjust or replace climate-control temperature sensor systems\*
- 14.0.6.10 Inspect, test, and adjust or replace blend-door or power-servo system\*
- 14.0.6.11 Inspect, test, and replace low-coolant temperature-blower control system\*
- 14.0.6.12 Inspect, test, and replace heater valve and controls\*
- 14.0.6.13 Inspect, test, and replace electric and vacuum motors, solenoids, and switches\*

UNIT 15: Cab and Trailer Maintenance and Repair

COMPETENCY 15.0.1: Maintain cab

COMPETENCY BUILDERS:

- 15.0.1.1 Repair doors, hinges, and latches
- 15.0.1.2 Inspect and repair mirrors
- 15.0.1.3 Install windshield, back glass, and side glass
- 15.0.1.4 Repair ventilation system
- 15.0.1.5 Repair seats and seat belts
- 15.0.1.6 Test and replace gauges
- 15.0.1.7 Install safety equipment

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COMPETENCY 15.0.2: Maintain trailer

COMPETENCY BUILDERS:

- 15.0.2.1 Test and repair lights
- 15.0.2.2 Test and repair trailer brake system
- 15.0.2.3 Inspect and lube landing gear
- 15.0.2.4 Identify and inspect coupling devices (e.g., kingpins, pintle hook)
- 15.0.2.5 Explain Department of Transportation (DOT) trip inspection

UNIT 16: Record Keeping

COMPETENCY 16.0.1: Use computer\*

COMPETENCY BUILDERS:

- 16.0.1.1 Demonstrate keyboarding skills\*
- 16.0.1.2 Use database\*
- 16.0.1.3 Schedule maintenance\*

COMPETENCY 16.0.2: Maintain records

COMPETENCY BUILDERS:

- 16.0.2.1 Explain shop documentation
- 16.0.2.2 Complete warranty contracts\*
- 16.0.2.3 File warranty contracts\*
- 16.0.2.4 Record maintenance activities

COMPETENCY 16.0.3: Maintain inventory\*

COMPETENCY BUILDERS:

- 16.0.3.1 Order supplies\*
- 16.0.3.2 Receive and store supplies\*

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UNIT 17: Employability Skills

SUBUNIT 17.1: Career Development

COMPETENCY 17.1.1: Investigate career options

COMPETENCY BUILDERS:

- 17.1.1.1 Determine interests and aptitudes
- 17.1.1.2 Identify career options
- 17.1.1.3 Research occupations matching interests and aptitudes
- 17.1.1.4 Select career(s) that best match(es) interests and aptitudes
- 17.1.1.5 Identify advantages and disadvantages of career options, including nontraditional careers
- 17.1.1.6 Assess differences in wages, annual incomes, and job opportunities based on geographic location
- 17.1.1.7 Develop a career plan

COMPETENCY 17.1.2: Analyze potential barriers to employment

COMPETENCY BUILDERS:

- 17.1.2.1 Identify common barriers to employment
- 17.1.2.2 Develop strategies to overcome employment barriers

UNIT 17: Employability Skills

SUBUNIT 17.2: Decision Making and Problem Solving

COMPETENCY 17.2.1: Apply decision-making techniques in the workplace

COMPETENCY BUILDERS:

- 17.2.1.1 Identify the decision to be made
- 17.2.1.2 Compare alternatives
- 17.2.1.3 Determine consequences of each alternative
- 17.2.1.4 Make decisions based on values and goals
- 17.2.1.5 Evaluate the decision made

COMPETENCY 17.2.2: Apply problem-solving techniques in the workplace

COMPETENCY BUILDERS:

- 17.2.2.1 Diagnose the problem and its causes
- 17.2.2.2 Identify alternatives and their consequences in relation to the problem
- 17.2.2.3 Examine multicultural and nonsexist dimensions of problem solving
- 17.2.2.4 Utilize resources to explore possible solutions to the problem
- 17.2.2.5 Compare and contrast the advantages and disadvantages of each solution
- 17.2.2.6 Determine appropriate action
- 17.2.2.7 Evaluate results

UNIT 17: Employability Skills

SUBUNIT 17.3: Work Ethic

COMPETENCY 17.3.1: Evaluate the relationship of self-esteem to work ethic

COMPETENCY BUILDERS:

- 17.3.1.1 Identify special characteristics and abilities in self and others
- 17.3.1.2 Identify internal and external factors that affect self-esteem

COMPETENCY 17.3.2: Analyze the relationship of personal values and goals to work ethic both in and out of the workplace

COMPETENCY BUILDERS:

- 17.3.2.1 Distinguish between values and goals
- 17.3.2.2 Determine the importance of values and goals
- 17.3.2.3 Evaluate how values affect goals
- 17.3.2.4 Identify short-term and long-term goals
- 17.3.2.5 Prioritize personal goals
- 17.3.2.6 Describe how personal values are reflected in work ethic
- 17.3.2.7 Describe how interactions in the workplace affect personal work ethic
- 17.3.2.8 Examine how life changes affect personal work ethic

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COMPETENCY 17.3.3: Demonstrate work ethic

COMPETENCY BUILDERS:

- 17.3.3.1 Examine factors that influence work ethic
- 17.3.3.2 Exhibit characteristics that reflect an appropriate work ethic

UNIT 17: Employability Skills

SUBUNIT 17.4: Job-Seeking Skills

COMPETENCY 17.4.1: Prepare for employment

COMPETENCY BUILDERS:

- 17.4.1.1 Identify traditional and nontraditional employment sources
- 17.4.1.2 Utilize employment sources
- 17.4.1.3 Research job opportunities, including nontraditional careers
- 17.4.1.4 Interpret equal employment opportunity laws
- 17.4.1.5 Explain the critical importance of personal appearance, hygiene, and demeanor throughout the employment process
- 17.4.1.6 Prepare for generic employment tests and those specific to an occupation/organization

COMPETENCY 17.4.2: Design a résumé

COMPETENCY BUILDERS:

- 17.4.2.1 Identify personal strengths and weaknesses
- 17.4.2.2 List skills and/or abilities, career objective(s), accomplishments/achievements, educational background, and work experience
- 17.4.2.3 Demonstrate legible written communication skills using correct grammar, spelling, and concise wording
- 17.4.2.4 Complete résumé using various formats
- 17.4.2.5 Secure references

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COMPETENCY 17.4.3: Complete and process job application forms

COMPETENCY BUILDERS:

- 17.4.3.1 Explain the importance of an application form
- 17.4.3.2 Identify ways to obtain job application forms
- 17.4.3.3 Describe methods for handling illegal questions on job application forms
- 17.4.3.4 Demonstrate legible written communications skills using correct grammar, spelling, and concise wording
- 17.4.3.5 Return application to proper person, request interview, and follow up

COMPETENCY 17.4.4: Demonstrate interviewing skills

COMPETENCY BUILDERS

- 17.4.4.1 Investigate interview environment and procedures
- 17.4.4.2 Explain the critical importance of personal appearance, hygiene, and demeanor
- 17.4.4.3 Demonstrate question and answer techniques
- 17.4.4.4 Demonstrate methods for handling difficult and/or illegal interview questions

COMPETENCY 17.4.5: Secure employment

COMPETENCY BUILDERS:

- 17.4.5.1 Identify present and future employment opportunities within an occupation/organization
- 17.4.5.2 Research the organization/company
- 17.4.5.3 Use follow-up techniques to enhance employment potential
- 17.4.5.4 Compare and evaluate job offers

UNIT 17: Employability Skills

SUBUNIT 17.5: Job Retention Skills

COMPETENCY 17.5.1: Analyze the organizational structure of the workplace

COMPETENCY BUILDERS:

- 17.5.1.1 Identify and evaluate employer expectations regarding job performance, work habits, attitudes, personal appearance, and hygiene
- 17.5.1.2 Be aware of and obey all company policies and procedures
- 17.5.1.3 Examine the role/relationship between employee and employer
- 17.5.1.4 Recognize opportunities for advancement and reasons for termination

COMPETENCY 17.5.2: Maintain positive relations with others

COMPETENCY BUILDERS:

- 17.5.2.1 Exhibit appropriate work habits and attitude
- 17.5.2.2 Identify behaviors to establish successful working relationships
- 17.5.2.3 Cooperate and compromise through teamwork and group participation
- 17.5.2.4 Identify alternatives for dealing with harassment, bias, and discrimination based on race, color, national origin, sex, religion, handicap, or age

UNIT 17: Employability Skills

SUBUNIT 17.6: Job Advancement

COMPETENCY 17.6.1: Analyze opportunities for personal and career growth

COMPETENCY BUILDERS:

- 17.6.1.1 Determine opportunities within an occupation/organization
- 17.6.1.2 Compare and contrast other opportunities
- 17.6.1.3 List benefits of job advancement
- 17.6.1.4 Evaluate factors involved when assuming a new position within or outside an occupation/organization

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COMPETENCY 17.6.2: Exhibit characteristics needed for advancement

COMPETENCY BUILDERS:

- 17.6.2.1 Display a positive attitude
- 17.6.2.2 Demonstrate knowledge of a position
- 17.6.2.3 Perform quality work
- 17.6.2.4 Adapt to changing situations and technology
- 17.6.2.5 Demonstrate capability for different positions
- 17.6.2.6 Participate in continuing education/training programs
- 17.6.2.7 Respect, accept, and work with ALL individuals in the workplace

UNIT 17: Employability Skills

SUBUNIT 17.7: Technology in the Workplace

COMPETENCY 17.7.1: Assess the impact of technology in the workplace

COMPETENCY BUILDERS:

- 17.7.1.1 Cite how past business/industry practices have influenced present business/industry processes
- 17.7.1.2 Investigate the use of technology in the workplace
- 17.7.1.3 Analyze how present skills can be applied to learning new technologies

COMPETENCY 17.7.2: Use a variety of technological applications

COMPETENCY BUILDERS:

- 17.7.2.1 Explore basic mathematical, scientific, computer, and technological principles
- 17.7.2.2 Use technology to accomplish assigned tasks
- 17.7.2.3 Create solutions to problems using technical means

UNIT 17: Employability Skills

SUBUNIT 17.8: Lifelong Learning

COMPETENCY 17.8.1: Apply lifelong learning to individual situations

COMPETENCY BUILDERS:

- 17.8.1.1 Define lifelong learning
- 17.8.1.2 Identify factors that cause the need for lifelong learning

COMPETENCY 17.8.2: Adapt to change

COMPETENCY BUILDERS:

- 17.8.2.1 Analyze the effects of change
- 17.8.2.2 Identify reasons why goals change
- 17.8.2.3 Describe the importance of flexibility when reevaluating goals
- 17.8.2.4 Evaluate the need for continuing education/training

UNIT 17: Employability Skills

SUBUNIT 17.9: Economic Education

COMPETENCY 17.9.1: Analyze global enterprise systems

COMPETENCY BUILDERS:

- 17.9.1.1 Identify characteristics of various enterprise systems
- 17.9.1.2 Examine the relationship between competition, risk, and profit
- 17.9.1.3 Illustrate how supply and demand influence price

COMPETENCY 17.9.2: Evaluate personal money management

COMPETENCY BUILDERS:

- 17.9.2.1 Describe the need for personal management records
- 17.9.2.2 Identify methods of taxation
- 17.9.2.3 Analyze how credit affects financial security
- 17.9.2.4 Compare types and methods of investments
- 17.9.2.5 Prepare a personal budget
- 17.9.2.6 Be an informed and responsible consumer
- 17.9.2.7 Analyze the effects of advertising on the consumer

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UNIT 17: Employability Skills

SUBUNIT 17.10: Balancing Work and Family

COMPETENCY 17.10.1: Analyze the effects of family on work

COMPETENCY BUILDERS:

- 17.10.1.1 Recognize how family values, goals, and priorities are reflected in the workplace
- 17.10.1.2 Identify present and future family structures and responsibilities
- 17.10.1.3 Describe personal and family roles
- 17.10.1.4 Analyze concerns of working parent(s)
- 17.10.1.5 Examine how family responsibilities can conflict with work
- 17.10.1.6 Resolve family-related conflicts
- 17.10.1.7 Explain how to use support systems/community resources to help resolve family-related conflicts

COMPETENCY 17.10.2: Analyze the effects of work on family

COMPETENCY BUILDERS:

- 17.10.2.1 Identify responsibilities associated with paid and nonpaid work
- 17.10.2.2 Compare the advantages and disadvantages of multiple incomes
- 17.10.2.3 Examine how work can conflict with family responsibilities
- 17.10.2.4 Describe how work-related stress can affect families
- 17.10.2.5 Identify family support systems and resources

UNIT 17: Employability Skills

SUBUNIT 17.11: Citizenship in the Workplace

COMPETENCY 17.11.1: Exercise the rights and responsibilities of citizenship in the workplace

COMPETENCY BUILDERS:

- 17.11.1.1 Identify the basic rights and responsibilities of citizenship
- 17.11.1.2 Examine the history and contributions of all racial, ethnic, and cultural groups

**COMPETENCY 17.11.2: Cooperate with others in the workplace**

**COMPETENCY BUILDERS:**

- 17.11.2.1 Identify situations in which compromise is necessary
- 17.11.2.2 Examine how individuals from various backgrounds contribute to work-related situations
- 17.11.2.3 Demonstrate initiative to facilitate cooperation
- 17.11.2.4 Give and receive constructive criticism to enhance cooperation

**UNIT 17: Employability Skills**

**SUBUNIT 17.12: Leadership**

**COMPETENCY 17.12.1: Evaluate leadership styles appropriate for the workplace**

**COMPETENCY BUILDERS:**

- 17.12.1.1 Identify characteristics of effective leaders
- 17.12.1.2 Compare leadership styles
- 17.12.1.3 Demonstrate effective delegation skills
- 17.12.1.4 Identify opportunities to lead in the workplace

**COMPETENCY 17.12.2: Demonstrate effective teamwork skills**

**COMPETENCY BUILDERS:**

- 17.12.2.1 Identify the responsibilities of a valuable group member
- 17.12.2.2 Exhibit open-mindedness
- 17.12.2.3 Identify methods of involving each member of a team
- 17.12.2.4 Contribute to the efficiency and success of a group
- 17.12.2.5 Determine ways to motivate others

**COMPETENCY 17.12.3: Utilize effective communication skills**

**COMPETENCY BUILDERS:**

- 17.12.3.1 Demonstrate the importance of listening
- 17.12.3.2 Demonstrate assertive communication
- 17.12.3.3 Recognize the importance of verbal and nonverbal cues and messages
- 17.12.3.4 Analyze written material
- 17.12.3.5 Prepare written material
- 17.12.3.6 Give and receive feedback
- 17.12.3.7 Articulate thoughts
- 17.12.3.8 Use appropriate language

- \* Advancing
- \*\* Futuring

UNIT 17: Employability Skills

SUBUNIT 17.13: Entrepreneurship

COMPETENCY 17.13.1: Evaluate the role of small business in the economy

COMPETENCY BUILDERS:

- 17.13.1.1 Identify the benefits of small business to a community
- 17.13.1.2 Analyze opportunities for small business in a community

COMPETENCY 17.13.2: Examine considerations of starting a business

COMPETENCY BUILDERS:

- 17.13.2.1 Research a business idea
- 17.13.2.2 Compare various ways to become a small business owner
- 17.13.2.3 Investigate factors to consider in financing a new business
- 17.13.2.4 Evaluate entrepreneurship as a career option

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